

PROPOSALS TO CONSERVE OR REJECT NAMES

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Arguments against the proposal 2302 by John & al. to reject the name *Gonyaulax catenella* (*Alexandrium catenella*)**Santiago Fraga,¹ Nagore Sampedro,² Jacob Larsen,³ Øjvind Moestrup⁴ & António J. Calado⁵**¹ Instituto Español de Oceanografía (IEO), Centro Oceanográfico de Vigo, Subida a Radio Faro 50, 36390 Vigo, Spain² Departament de Biologia Marina i Oceanografia, Institut de Ciències del Mar, CSIC, Pg. Marítim de la Barceloneta, 37–49, 08003 Barcelona, Spain³ IOC Science and Communication Centre on Harmful Algae, University of Copenhagen, Marine Biological Section, Universitetsparken 4, 2100 Copenhagen Ø, Denmark⁴ Marine Biological Section, Department of Biology, University of Copenhagen, Universitetsparken 4, 2100 Copenhagen Ø, Denmark⁵ Department of Biology and GeoBioSciences, GeoTechnologies and GeoEngineering (GeoBioTec) Research Unit, University of Aveiro, 3810-193 Aveiro, Portugal

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John & al. (in *Taxon* 63: 932–933. 2014) proposed to reject the name *Gonyaulax catenella* Whedon & Kof., the basionym of *Alexandrium catenella* (Whedon & Kof.) Balech in order to permit usage of the more recent name *Alexandrium fundyense* Balech. The proposal was based on Art. 56.1 of the *ICN* (McNeill & al. in *Regnum Veg.* 154. 2012), which states that a name that would cause a disadvantageous nomenclatural change may be proposed for rejection. In our opinion the authors do not provide the necessary nomenclatural background for this proposal and misinterpret some of the data in the literature. In the following we argue that the proposal should be rejected as its acceptance will cause serious confusion. Species of *Alexandrium* belong to some of the world's most harmful algae, and it is therefore essential that no unnecessary confusion is introduced to researchers and to the public, including monitoring personnel, regarding the names of these species.

Background. — *Alexandrium catenella* (Whedon & Kof.) Balech (in Anderson & al., *Toxic Dinoflagellates*: 37. 1985) was originally published with a detailed description as *Gonyaulax catenella* Whedon & Kof. (in *Univ. Calif. Publ. Zool.* 41: 25–34. 1936) together with *Gonyaulax acatenella* Whedon & Kof. The main difference between these two species was the ability to form chains and a smaller length/width ratio in the first species. At the time, chain formation was considered a very important taxonomic character while today it is considered as a variable character. Hence, in their descriptions *G. catenella* was compared with other chain-forming species, even from other genera, while *G. acatenella* was only compared with *G. tamarensis* M. Lebour (*Dinoflag. N. Seas*: 95, pl. XIV, fig. 1. 1925) described from the estuary of the River Tamar, England.

Gran & Braarud (in *J. Biol. Board Canada* 1: 279–467. 1935) in a study of the phytoplankton in the Bay of Fundy and the Gulf of Maine reported the occurrence of *Gonyaulax tamarensis* (as “*Goniaulax*”) as they found no significant differences between their cells and Lebour's drawings with the original description.

Braarud (in *Norske Vidensk.-Akad., Mat.-Naturvidensk. Kl., Avh.* 5: 1–18. 1945) described three varieties of *G. tamarensis*: var. *excavata* from the Bay of Fundy and Norway, var. *typica* for the Plymouth strains and var. *globosa* for what is now known as *Alexandrium ostenfeldii* (Paulsen) Balech & Tangen (in *Sarsia* 70: 333. 1985). Balech raised var. *excavata* to species level as *Gonyaulax excavata* (Braarud)

Balech (in *Revista Mus. Argent. Ci. Nat.*, “Bernardino Rivadavia” *Inst. Nac. Invest. Ci. Nat., Hidrobiol.* 3: 28 [pl. 7, figs. 119–124]. 1971). Balech & Tangen (l.c.) transferred *Gonyaulax excavata* to the genus *Alexandrium* as *A. excavatum* (Braarud) Balech & Tangen (non sensu Balech, l.c. 1971: figs. 119–124) based on material from the type locality of Braarud's variety.

Subsequently the presence or absence of a pore in the first apical plate of the cell's amphiesma became an important taxonomic character in some of these species. Thus in the chain-forming species *Alexandrium fraterculum* (Balech) Balech (l.c. 1985, “*fraterculus*”), initially named *Gonyaulax fratercula* Balech (in *Bol. Inst. Biol. Mar.* 4: 31. 1964), the presence of the pore was considered one of the main differences between this species and *A. catenella*.

Balech (l.c. 1985) considered the ventral pore to be a conservative character, and as some strains of *A. tamarensis* from the Bay of Fundy had a ventral pore and others not, he described the latter as: “*A. fundyense* n. sp. (Fig. 18). Very close to *A. excavatum* but constantly lacking ventral pore. Perhaps a subspecies. Dimensions: L 27–46, A 27–44 µm. Distribution in the Bay of Fundy.”

More recent studies. — In the first molecular study, Scholin & al. (in *J. Phycol.* 30: 999–1011. 1994) observed that strains of the *Alexandrium tamarensis/catenella/fundyense* species complex fell into clades that did not correspond with the morphospecies concept. The strains from the type locality of *A. tamarensis* near Plymouth, England appeared in a separate clade, while another clade contained all strains from North America: all strains from Bay of Fundy, with and without a ventral pore, strains identified as *A. catenella* from near its type locality in San Francisco, and *A. tamarensis* and *A. fundyense* from other localities on the west coast of North America.

Subsequent molecular studies of a large number of strains of the *Alexandrium catenella/tamarensis/fundyense* complex from many parts of the world (Lilly & al. in *J. Phycol.* 43: 1329–1338. 2007) grouped the strains into five clades, and it was recently claimed that these clades correspond to five different species (John & al. in *Protist* 165: 779–804. 2014). All sequences of strains from the west coast of North America, where the type locality of *A. catenella* is located, belonged to Group I, together with all the strains with or without ventral pore from the Bay of Fundy and Gulf of Maine (including the type locality of *A. fundyense*). Strains identified as *A. catenella* from

Chile and the west coast of South Africa also fell in Group I. As only Group I strains have been found at the type locality of *A. catenella*, the original description of this species was therefore most likely based on cells belonging to Group I. If all strains of Group I are to be merged into a single species, the oldest available name for this species is therefore *A. catenella*.

John & al. (l.c. [Taxon]) make a number of statements with which we do not concur:

- “A majority of the Group I sequences currently come from isolates in regions adjacent to the type locality of *A. fundyense* (Bay of Fundy, Canada).”

This is not correct. Sequences of strains belonging to Group I originate from both the Northern and Southern Hemispheres, and from both the Atlantic and Pacific Oceans. Those from Chile and South Africa were correctly identified as *A. catenella*. Other strains of Group I (identified as *A. tamarensis*) are from North European coasts, north Japan, northeast Russia, Argentina and Brasil.

- “Since most of the published studies on *A. fundyense* and *A. tamarensis* encompass Group I and Group III sequences, respectively, these revised species designations cause a minimum of confusion with regard to the current literature.”

When Lilly & al. (l.c.) defined the five groups of the *A. tamarensis* complex based on molecular data, strains identified as *A. fundyense* were indeed included in Group I only, but strains identified as *A. tamarensis* were included in all five groups.

- “These observations indicate that the Group I morphology is more variable than originally described and that the *A. catenella* species description was incorrectly based on a population of *A. fundyense* cells exhibiting chain formation and the shape slightly broader than long (i.e., *A. catenella* simply represents one of the distinct morphological variants of *A. fundyense*).”

This turns argumentation around and ignores the rule of priority. A more correct wording is “These observations indicate that the Group I morphology is more variable than originally described and that the *A. fundyense* species description was incorrectly based on a population of *A. catenella* that did not form chains and is slightly longer than broad (i.e., *A. fundyense* simply represents one of the distinct morphological variants of *A. catenella*).”

- “The identity of the type material on which this species was based remains unclear. No type was designated by the author and strains isolated from the region from which the material most likely originated that was the basis of the species description belong to a different species (*A. fundyense*).”

Type material is lacking of both *A. catenella* and *A. fundyense*. Both type localities fall within the geographic distribution of strains of Group I. At the type locality of *A. catenella* only Group I has been found and there is presently no reason to question the identity of the material from this locality.

- “*Alexandrium catenella* could in principle supplant the name *A. fundyense* and be applied to all Group I strains, because its original description (Whedon & Kofoed, l.c.) predates that of *A. fundyense* (Balech, l.c. 1985). However, a large number of studies on Group I strains have been published using the name *A. fundyense* and making this nomenclatural change would cause considerable confusion in the research community.”

According to Art. 51.1 of the ICN “a legitimate name must not be rejected merely because it, or its epithet, is inappropriate or disagreeable, or because another is preferable or better known (but see Art. 56.1), or because it has lost its original meaning”. With the exception of Anderson & al. (in Mar. Biol. 120: 467–478. 1994) the name *A. fundyense* has mainly been applied locally in studies from the Bay of Fundy/Gulf of Maine and adjacent areas. It has been reported sporadically from other parts of the world, in all cases without molecular characterization. By comparison, the name *A. catenella* has been used in numerous studies of strains belonging to Group I, most recently by Navarro & al. (in PLoS ONE 9(8): e105794. 2014) and Díaz & al. (in Harmful Algae 40: 9–22. 2014).

- “Retention of *A. catenella* would foster continued confusion in the literature concerning whether the data in a given study pertains to Group I or Group IV species.”

All strains of Group IV have now been assigned to the new species *A. pacificum* Litaker (in John & al., l.c. [Protist]). It would, however, create considerable confusion if researchers and monitoring personnel from the west coast of North America, Chile and the southwest coast of Africa, etc. would have to change the well-known species name *A. catenella* for the more recent name *A. fundyense*, usually applied mainly to material from the Bay of Fundy region. It would further create unnecessary confusion outside the Gulf of Maine region regarding the identity of the organisms described in the extensive literature on Group I strains.

In conclusion, there is in our opinion no scientific justification for discarding the well-established name *A. catenella* for the more recent name *A. fundyense*. The continued use of *A. catenella* does not cause a disadvantageous nomenclatural change, nor is it inappropriate or disagreeable.